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ABSTRACT

It sometimes happens that one is unable to recall a word or name that he feels he knows very well. This state of frustrated recall is referred to as a tip-of-the-tongue (TOT) experience. Two experiments were devised to compare the ability of a weak trace and a decoding-failure model to predict the conditions under which TOT reports would be most likely. A weak trace model asserts that TOTs will be more frequent when there is partial retrieval of the forgotten information or when easy items and good recallers are tested. A decoding failure model predicts instead that the TOT state represents the accessing of an undecodable retrieval plan and is more likely to occur for materials encoded by elaboration strategies than by rehearsal strategies. Analysis of feeling-of-knowing ratings and recall performance for elements in word matrices and for paired associates revealed that TOTs are more likely to be reported for elaboratively encoded stimuli and that this effect cannot be attributed to the increase in trace strength typically afforded by mnemonic strategies. These data suggest that it is the failure to decode an elaborated retrieval plan that generates the TOT experience. (Author)

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RESEARCH BULLETIN

THE TIP-OF-THE-TONGUE PHENOMENON: A DECODING FAILURE ACCOUNT

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Abstract

It sometimes happens that one is unable to recall a word or name that he feels he knows very well. This state of frustrated recall is referred to as a tip-of-the-tongue (TOT) experience. Two experiments were devised to compare the ability of a weak trace and a decoding-failure model to predict the conditions under which TOT reports would be most likely. A weak trace model asserts that TOTs will be more frequent when there is partial retrieval of the forgotten information or when easy items and good recallers are tested. A decoding failure model predicts instead that the TOT state represents the accessing of an undecodable retrieval plan and is more likely to occur for materials encoded by elaboration strategies than by rehearsal strategies. Analysis of feeling-of-knowing ratings and recall performance for elements in word matrices and for paired associates revealed that TOTs are more likely to be reported for elaboratively encoded stimuli and that this effect cannot be attributed to the increase in trace strength typically afforded by mnemonic strategies. These data suggest that it is the failure to decode an elaborated retrieval plan that generates the TOT experience.

The Tip-of-the-Tongue Phenomenon: A Decoding Failure Account

It sometimes happens that one will forget a very familiar word or name and be frustrated for minutes or hours by the feeling that it is there--somehow beyond recall and yet very much on the tip of one's tongue. This sort of feeling is an important phenomenon for the memory theorist because it would appear to provide a novel source of information about how memory is organized and how we keep track of the extraordinary amount of data we maintain in long-term memory. I would like to advance a new account of this tip-of-the-tongue (TOT) phenomenon and compare its predictive power with that of a more widely accepted model.

Nine years ago Roger Brown and David McNeill sought to produce TOT experiences in the laboratory by presenting subjects with dictionary definitions of rare words and asking them to recall those words. The technique sometimes produced reports of TOT states when recall failed, and Brown and McNeill (1966) were able to show that such reports were often accompanied by accurate information as to the first letter of the word or the number of syllables it contained. This paradigm has dominated subsequent TOT research and has engendered certain misconceptions about how the phenomenon should be investigated. In particular, two points require clarification. The first is that tip-of-the-tongue states need not be peculiar to the forgetting of unfamiliar words nor to the failure of definition probes. As currently conceived a TOT paradigm requires only that some verbal data have been stored and that there be some way of indicating to a subject what it is that he must recover from memory. In one experiment I have used a word's

spatial location within a five-by-five matrix as its recall probe; in a second experiment, one word of a studied pair served as a recall probe for its partner. In general one can supply a feeling-of-knowing judgment for anything that he happens to forget. If this feeling of knowing is relatively intense, a person might report that he has a tip-of-the-tongue sensation.

My second point is that while it might be very interesting to know that people who report TOT states later remember the forgotten word, or can recognize it, or can provide evidence of partial recall, such validation data will not help explain why some forgotten words elicit more TOT states than others and why some forgetters report more TOT states than others. If we are to understand what kind of memory event those states represent, we must treat TOT reports as dependent variables and determine those experimental conditions that influence such activity. The primary task in terms of understanding the memory process is to discover the determinants of the TOT experience. As such, subjects' feeling-of-knowing ratings are scored for the conditional probability of a TOT report in the first experiment and for the mean feeling-of-knowing value in the second experiment.

My purpose here is to introduce a model of TOT genesis, to contrast its predictions with those of a popular theory, and to show that the results of two experiments are more congruent with the following model: Miller, Galanter, and Pribram (1960) suggested in Plans and the Structure of Behavior that recall is mediated by the execution of retrieval plans which specify how particular information is to be recovered from the memory store. For

our purposes it is important to distinguish the existence of a retrieval plan from its successful execution. In fact, I would like to propose that the TOT state represents a situation in which a retrieval program exists and has been accessed by a recall probe but cannot be successfully executed so as to produce the appropriate verbal output. What is on the tip of one's tongue is the internal memory code for a lexical item, and what is involved in TOT recovery is the final transformation of that code into the acoustic and orthographic features that specify the actual word (cf. Prytulak, 1971). According to this decoding failure account, then, the amount of TOT activity will be a function of the number of retrieval plans that have been constructed and which subsequently fail.

The traditional model of TOT genesis focuses instead on the relative intensity of the probed memory trace. This model assumes that if the strength of a memory trace exceeds a critical level, retrieval will become possible; if the strength of the trace does not exceed that value the trace will be too weak to be completely discriminated and retrieval will fail. However, as Figure 1 shows, some of these weak traces will be relatively stronger than others and on occasion may be of sufficient strength to convince an individual that they are almost recallable. Such traces are hypothesized to have exceeded a second critical value, a TOT threshold. Variables which influence the relative intensity of the memory trace should therefore also increase TOT activity. Given that more target attributes will be recalled as a memory trace increases in intensity, a good measure of the strength of a weak trace will be how much of a forgotten target can be

retrieved. According to this weak trace account, TOT activity ought to be a function of the relative amount of recall (cf. Blake, 1973).

Insert Figure 1 about here

Let me now describe my first study. Subjects studied separate clusters of one, two, or four words embedded within the various cells of five-by-five word matrices. The construction of retrieval plans was encouraged in a mediated-learning condition by using elaborative encoding instructions and discouraged in a nonmediated-learning condition by using rote rehearsal instructions. The elaborative encoding instructions emphasized the importance of developing a meaningful image, association, or relation by which to link a word with its spatial location while the rote rehearsal instructions emphasized the importance of mentally repeating a target word as much as possible. Three seconds of study time was allowed for each word and a recall test followed the presentation of the last cluster in a matrix. Immediate recall was tested by asking subjects to write the words into the appropriate cells of an empty matrix and to report a feeling-of-knowing rating whenever they were unable to recall a word. Ratings of 4, 5, or 6 on this scale corresponded to a TOT report by a subject, while ratings of 3, 2, or 1 corresponded to a non-TOT report. Forty undergraduate subjects encoded the elements of one word matrix according to the elaborative encoding instructions and another matrix according to rote rehearsal instructions.

The major problem in comparing the TOT activity produced by decoding failure with that deriving from the probing of weak stimulus traces is that

elaborative encoding strategies are known to mediate superior recall (Montague, 1972, pp. 239-271). Thus it could be argued that the existence of retrieval plans increases trace strength and it is this increment in trace intensity that promotes TOT activity rather than the use of retrieval plans per se. One way to eliminate this confounding variable is to observe TOT activity when the two encoding conditions result in comparable levels of partial recall. It is for this reason that the design involved the recall of word clusters of different sizes. The use of memory targets composed of differing numbers of words made it possible to analyze TOT activity as a function of the relative amount of recall. Looking first at the data in Figure 2 for two-word clusters when neither word was recalled, we find that

Insert Figure 2 about here

when forgetting occurs elaborative encoding results in a significantly higher TOT rate than does rehearsal encoding. If we then consider two-word clusters in which one word was successfully recalled, we can see that although the general level of TOT activity increases with the improvement in recall performance, a significant TOT advantage still accrues to the elaborative encoding strategy. A similar pattern holds for both one-word and four-word clusters: TOT activity is not a simple function of trace strength. With the exception of the last two recall categories of four-word clusters, there is significantly more TOT activity for elaboratively encoded stimuli. Thus the TOT advantage of elaborative encoding cannot be wholly explained in terms of the facilitation of response strength.

A second study was devised to replicate the TOT advantage of elaborative encoding under very different experimental conditions. In this experiment, 32 undergraduate subjects had eight seconds to study each of 52 word pairs by imaginal and semantic elaboration (n = 16) or by rote rehearsal (n = 16). Four hours later subjects demonstrated recall by supplying the appropriate paired associates. As in the first experiment a subject used a 6-point scale to report his feeling of knowing an unrecalled word. The confounding effects of superior elaborative recall were statistically controlled by a procedure different from that employed in the first experiment. This approach focuses on the predictions made by a trace strength model about TOT activity when good or poor recallers forget and when easy or difficult items are forgotten. By definition, good recallers are those who typically access more intense stimulus traces than do poor recallers; the distribution of trace intensities for a set of memory targets for a good recaller will then be displaced to the right with respect to the distribution of a poor recaller. It is apparent from Figure 3 that more elements of a good

Insert Figure 3 about here

recaller's memory set will exceed the recall threshold and be remembered. It is also apparent that the relative number of nonrecalled elements that are of sufficient intensity to exceed the TOT threshold will be much greater for good than poor recallers. The difference between easy and difficult items can be represented in a similar fashion. Nonrecallers will have relatively more intense traces for easy items and will therefore be

more likely to report TOTs for easy than for difficult items (cf. Atkinson & Juola, 1971). Thus the weak trace model of TOT genesis clearly predicts that good recallers who forget ought to report more TOTs than poor recallers who forget, and that easy items which are forgotten ought to occasion more TOTs than difficult items which are forgotten. On the other hand the decoding failure model predicts that it is the breakdown of organized retrieval plans which prompts TOT reports, and that elaborative encoding ought to result in more TOT activity than rote rehearsal because more retrieval plans will be available for incomplete decoding. The decoding failure hypothesis predicts that there will be no difference in the relative amount of TOT activity among good and poor recallers or among easy and difficult items that is not due to variations in encoding conditions.

Subjects within each strategy condition were blocked into good and poor recallers on the basis of the number of paired associates they recalled correctly, while word pairs were blocked into easy and difficult items on the basis of how often they were correctly recalled. Mean TOT ratings and the recall scores for subjects and words were then entered into separate analyses of variance. Since the issue is whether response strength or encoding mediation is more important in controlling TOT activity, the relevant data from these analyses are the percentages of variance in the TOT ratings attributable to encoding strategy and to recall skill. In Table 1 the significance levels refer to the results of the associated F

Insert Table 1 about here

tests, while the numbers represent the relative amount of variance accounted for by a particular factor. Recall level refers to the factor created by blocking subjects and words into high or low recall. Both strategy and recall level account for about the same amount of variance in recall performance of individual subjects, thereby demonstrating that the blocking manipulation does produce a powerful response strength factor. However, the variance in mean TOT ratings of individual subjects due to encoding strategy is twice that due to recall skill. The analysis of individual words is even more revealing: while the blocking of words into easy and difficult items constitutes a much more powerful source of variance in recall performance than does the effect of encoding strategy, it is encoding strategy which is the important source of variance in the TOT ratings assigned to individual words. Although recall ease is a significant factor in the TOT data, the impact of encoding strategy is nearly three times as large. As in the first experiment, it was the elaborative encoding condition that produced the greater amount of TOT activity when retrieval failed.

The results of these two experiments indicate that tip-of-the-tongue reports are more likely to be made when learning has been mediated by retrieval plans, and that the TOT advantage of the elaborative encoding condition cannot be attributed to the fact that such encoding simply facilitates retrieval. The more appropriate interpretation of these data is that elaborative encoding results in the generation of more organized retrieval plans and that it is the failure of such retrieval plans that produces TOT states. There are two important implications of this

interpretation. The first is that TOT recovery ought to be facilitated more by the representation of information about the structure of the aborted retrieval plan than by information about the physical features of the original stimulus. This possibility makes it clear that studying the validity of TOT reports may be premature when an adequate model of TOT genesis is not available. If the TOT feeling represents a claim that a retrieval plan is available but not functional, then the appropriate criterion for a validation study must refer to the structure of the retrieval plan rather than to the physical form of the encoded information. A second implication is that the investigation of partial recall in the TOT state may not tell us as much about the organization of semantic memory as Brown and McNeill have led us to believe. To the degree that the decoding failure model of TOT genesis is valid, further TOT research is likely to reveal more about the structure of retrieval plans than the structure of long-term memory. As such, we will have to develop much clearer notions about the nature of the encoding process before we can expect to understand what it is that we know in the tip-of-the-tongue state.

References

Atkinson, R. C., & Juola, J. F. Factors influencing speed and accuracy of word recognition. Institute for Mathematical Studies in the Social Sciences, Technical Report No. 177, Stanford University, August 1971.

Blake, M. Prediction of recognition when recall fails: Exploring the feeling-of-knowing phenomenon. Journal of Verbal Learning and Verbal Behavior, 1973, 12, 311-319.

Brown, R., & McNeill, D. The "tip-of-the-tongue" phenomenon. Journal of Verbal Learning and Verbal Behavior, 1966, 5, 325-337.

Miller, G. A., Galanter, E., & Pribram, K. H. Plans and the structure of behavior. New York: Holt, Rinehart, & Winston, 1960.

Montague, W. E. Elaborative strategies in verbal learning and memory. In G. H. Bower (Ed.), The psychology of learning and motivation: Advances in research and theory. Vol. 6. New York: Academic Press, 1972.

Prytulak, L. S. Natural language mediation. Cognitive Psychology, 1971, 2, 1-56.

Footnote

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Table 1

Percentage of Recall and TOT Variance Accounted for by

Encoding Strategy and Recall Performance

Source of Variance	Individual Subjects		Individual Words	
	Recall Data	TOT Data	Recall Data	TOT Data
Strategy	38.8***	13.3**	28.9**	18.6***
Recall Level	34.3***	6.4	50.7***	6.4*
Interaction	1.3	0.0	3.8**	0.0

Note. Strategy is a between-subjects and within-words factor in the associated analyses of variance while recall level is a between-subjects and between-words factor. The recall and TOT data were obtained for 48 word pairs studied by 16 elaborative subjects and 16 rehearsal subjects.

*$p < .05$

**$p < .025$

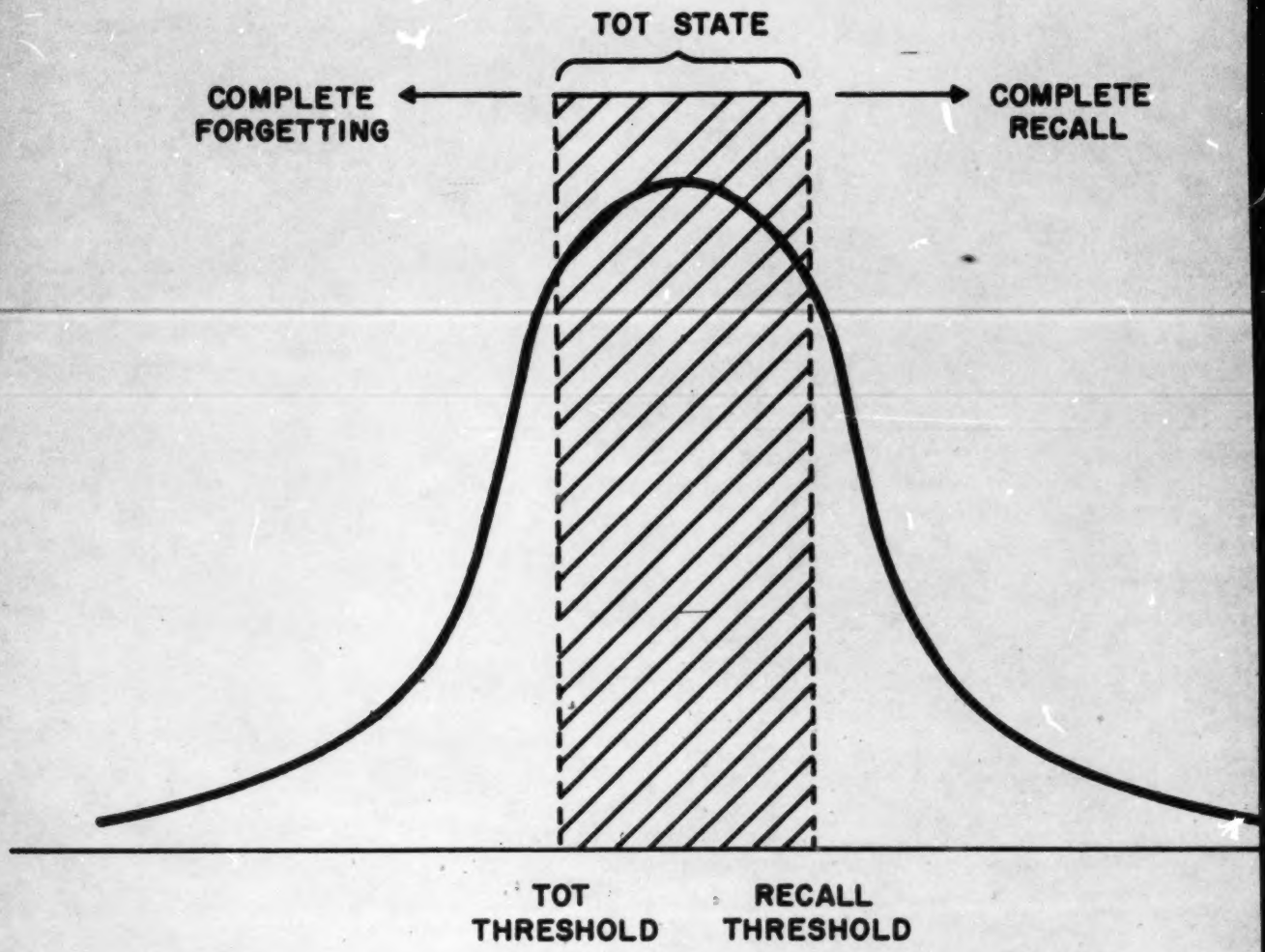
***$p < .001$

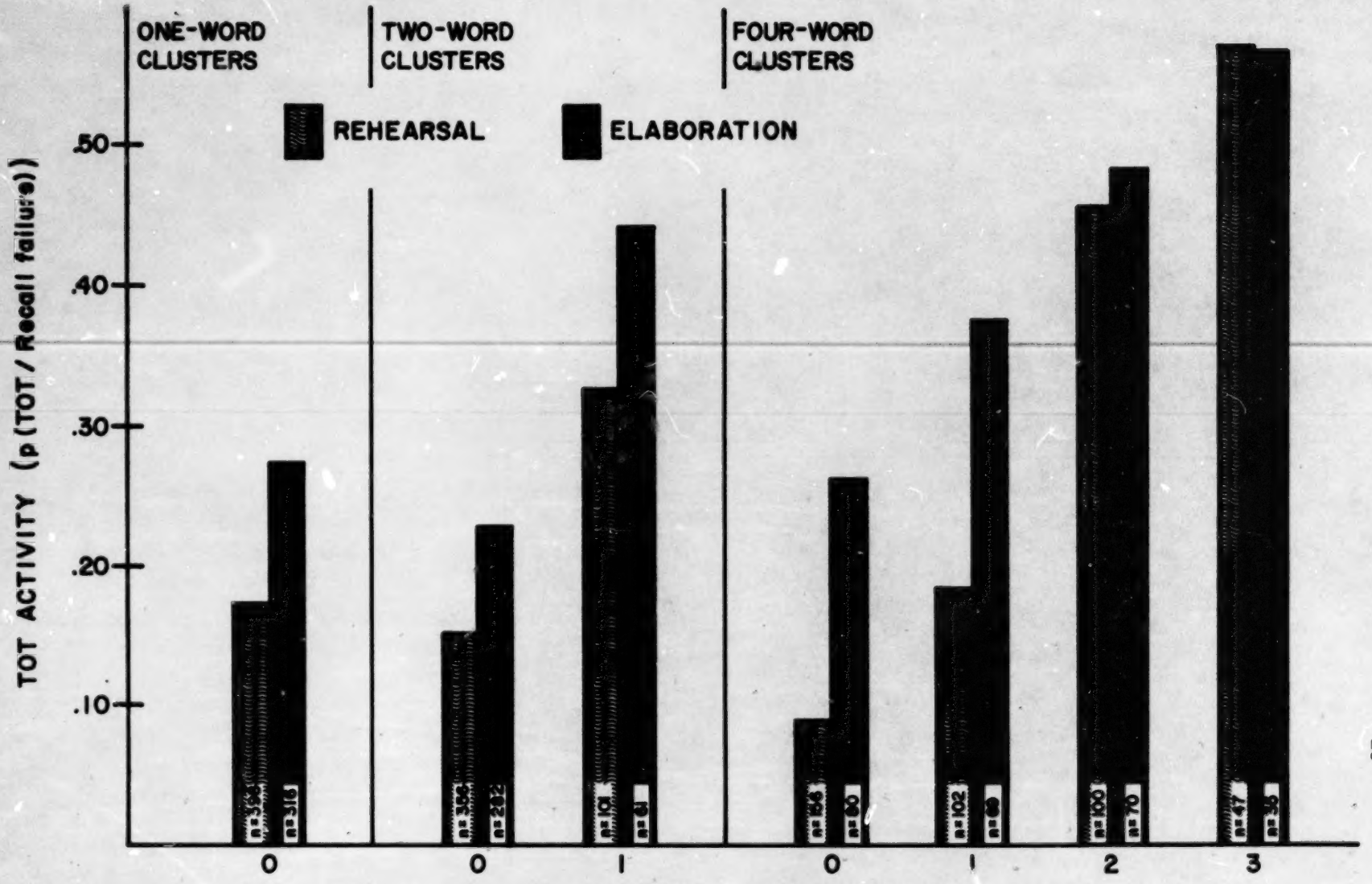
Figure Captions

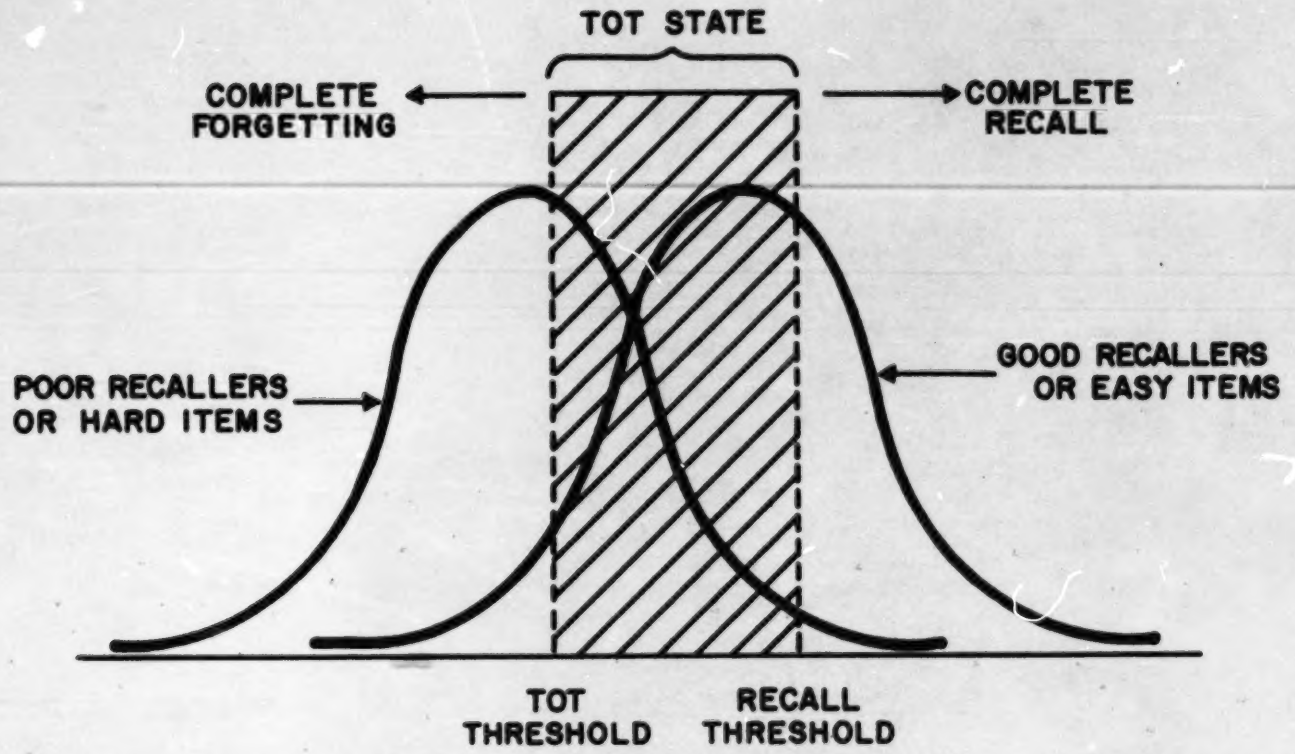
Figure 1. Hypothetical distribution of response strength values from a particular subject population for a specific memory target with TOT and recall thresholds located arbitrarily. According to weak trace model of TOT genesis, the TOT region represents proportion of population reporting TOT states as a consequence of having accessed traces whose strength exceeds some TOT criterion but not the recall criterion.

Figure 2. TOT activity in word clusters of different sizes as a function of the number of words correctly recalled from a cluster and the nature of the encoding strategy. Each combination of cluster size and strategy represents data on 24 word probes from each of 40 subjects. One-tailed *z* tests of the significance of a difference between two independent proportions show the TOT advantage of elaborative encoding to be significant at the .025 level in all recall categories except the last two in the four-word cluster condition.

Figure 3. Hypothetical distributions of trace strength values from two subject or stimulus populations with TOT and recall thresholds arbitrarily defined. Population displaced to the right contains traces of greater mean strength and is characterized by relatively more TOT activity because, according to the weak trace model of TOT genesis, a proportionately greater number of those traces exceed TOT criterion while failing short of recall strength.


TOT STATE
COMPLETE FORGETTING
COMPLETE RECALL
TOT THRESHOLD
RECALL THRESHOLD
RESPONSE STRENGTH (arbitrary units)


ONE-WORD CLUSTERS
TWO-WORD CLUSTERS
FOUR-WORD CLUSTERS
REHEARSAL
ELABORATION
TOT ACTIVITY (p (TOT / Recall failure))
.50
.40
.30
.20
.10
n=354
n=316
n=308
n=282
n=101
n=81
n=156
n=80
n=102
n=68
n=100
n=70
n=47
n=36
0
0
1
0
1
2
3
NUMBER OF WORDS CORRECTLY RECALLED FROM A CLUSTER


TOT STATE
COMPLETE FORGETTING
COMPLETE RECALL
POOR RECALLERS OR HARD ITEMS
GOOD RECALLERS OR EASY ITEMS
TOT THRESHOLD
RECALL THRESHOLD
RESPONSE STRENGTH (arbitrary units)